Space Weather Forecast

Issued on Thursday, 16 June 2022 at 13:05 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

---

Space Weather Forecast Headline: Chance of Moderate-class X-ray flares throughout. Decreasing chance of G1 (Minor Geomagnetic Storm) conditions to end current UTC week.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity rose to become moderate in the past 24 hours, with a solitary moderate-class X-ray flare emitted 16/0353UTC from the most complex sunspot region on the facing side. This was one of up to nine sunspot regions at present. The spot group itself showed an overall decrease in spot count and area in the 24 hours, however it retained its overall complexity, in particular in its trailing group.

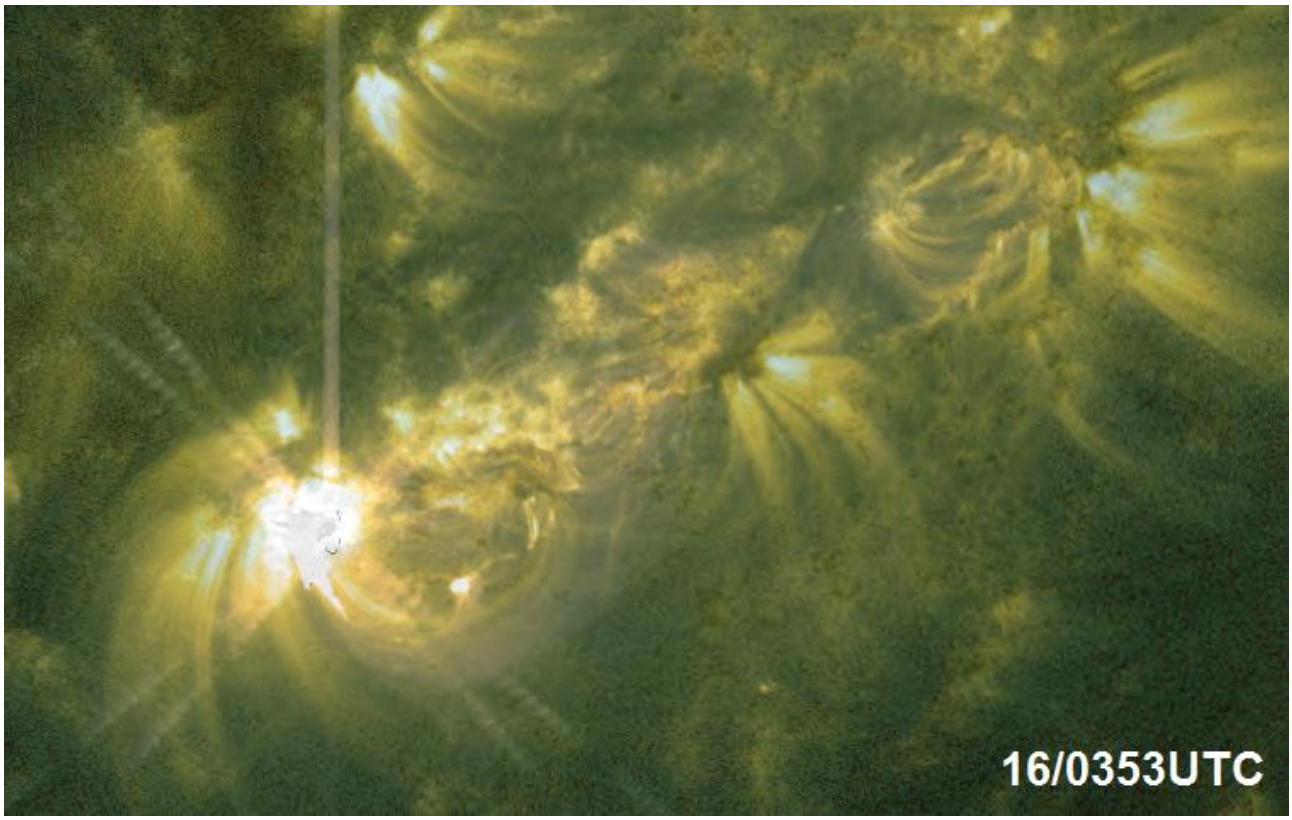

Figure 1: False-colour composite extreme UV satellite image of the largest sunspot group on the disc and its environs. As well as a proxy for the flare itself (star-shaped artefact to left of image), the magnetic field lines can also be seen (yellow arcs). Image processing courtesy of helioviewer.org.

The observed X-ray trace was otherwise perhaps unexpectedly flat in the period, with a gradual

© Crown Copyright 2022. All Rights Reserved.

decline observed as no other groups offered a significant contribution to flares. In terms of trends, three moderately-sized bipolar groups all showed proliferation of spots and growth, while all other areas were steady or in apparent decline. Near the western solar horizon, a sunspot became less distinct in the west due to the increasingly restricted viewing angle and perhaps also a genuine simplifying trend, as a new region arrived in the northeast by the period's end.

There are a few 'filaments' present on the current sun (arcs of plasma that can lift to become Coronal Mass Ejections (CMEs)), the largest of which is nestled to the east of (nominally) the second most complex spot group on the sun. This arrangement makes it one to watch, however as already stated it was unproductive in the 24 hours.

No Earth-directed CMEs were observed in available imagery. Events seen heading off-ecliptic (the plane containing the Earth and Sun) to the southwest and northeast are not expected to affect Earth.

Solar Wind / Geomagnetic Activity: The solar wind was symptomatic of the tail of influence from a Coronal Mass Ejection (CME), thought to be that emitted on 13 June and forecast to deliver a glancing blow to Earth.

To this end, the solar wind speed fell from strong to elevated levels in the period, with the number of particles comprising the solar wind showing a similar slight decline from slightly elevated levels over the 24 hours. The magnitude of the magnetic field peaked early in the reporting window at slightly elevated levels, while the north-south component showed a drift from largely anti-aligned with Earth's field, to become co-aligned and finally smaller scale and erratic in nature later in the UTC morning of 16 June.

These residual CME effects may mask any contribution from onset of the expected fast solar wind from a 'coronal hole', and there is therefore a chance that this may have already commenced.

The net effect of the above solar wind measures was an early provisional peak in the 12-15UTC interval just below Minor Storm G1, otherwise gradually falling with time as both the speed and the anti-aligned component of the magnetic field waned.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: There is a daily chance of moderate solar activity, largely from the most complex sunspot group, although there are numerous regions on the current Sun that may contribute. The front-side population does not alter significantly in the period, and so barring development, the daily chance of moderate-class and slight chance of strong-class persists unchanged throughout.

Solar Wind / Geomagnetic Activity: Solar winds are expected to be elevated through 16 to 18 June (days one to three) due to waning CME effects followed by fast wind 'coronal hole' enhancements from. On day four (19 June) winds are expected to decrease as these coronal hole features rotate from a geoeffective position.

The initial slight chance of Minor Geomagnetic Storm G1 should gradually decrease through the coming four days, such that largely quiet conditions should predominate by the end of the period.

Energetic Particles / Solar Radiation: There is a daily slight chance of an S1 or greater solar radiation storm event occurring, largely a consequence of the sheer number of sunspots on the Sun.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	5	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	30	30	30	30
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	10	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.